



SEQUENCE LISTING

<110> Kosan Biosciences, Inc.
Katz, Loenard
Revill, Peter

<120> PRODUCTION OF POLYKETIDES

<130> 30062-20048.10

<140> US 10/607,809

<141> 2003-06-27

<150> US 09/697,022

<151> 2000-10-25

<150> US 60/161,414

<151> 1999-10-25

<160> 5

<170> FastSEQ for Windows Version 4.0

<210> 1

<211> 1980

<212> DNA

<213> Saccharopolyspora erythraea

<220>

<221> CDS

<222> (343)...(1594)

<400> 1

```
gatctggatg tcgaagccgg gacggagcgg gatgacggcg tcagcggcgt cttccatgtg 60
gaactcctta tccggacgac tcgacctggt tggctaagcg gagattaggt ctgcgcgcgc 120
gaaaccgccc agcggagcgc cgagatcctc acctgatcag gtaaggatct tcattcgatg 180
tcatgtagcc agatttcggc tgaactggtc caccgatccc attcgtgacc atgcgtgtcc 240
actttggagc ggggtgcgtc gttcggccta gtggcgtgct ccgcgggtgat caagtgttag 300
gttagcctca gctcagcggg gtcgacggat ggagtgaacg gc gtg gcg ggc gac 354
                                     Val Ala Gly Asp
                                     1
```

```
gtg gaa ctc gcg gac agg gct cga cga cgc gcg tgc cgg ctg ctc agg 402
Val Glu Leu Ala Asp Arg Ala Arg Arg Arg Ala Cys Arg Leu Leu Arg
   5              10              15              20
```

```
cgt tgg ctg gcc gag acg cac act ccg gtg gag ccc ggc ccg ctg tcc 450
Arg Trp Leu Ala Glu Thr His Thr Pro Val Glu Pro Gly Pro Leu Ser
              25              30              35
```

```
ctg cgg atc ggc ccg gtg cgg gtg tcg gcc gag gtc gct tac cgc tcg 498
Leu Arg Ile Gly Pro Val Arg Val Ser Ala Glu Val Ala Tyr Arg Ser
              40              45              50
```

```
ccg acg ggc gcc cac ggg ttc ggc ccg atc cgc gtc ctc gat gcc gag 546
Pro Thr Gly Ala His Gly Phe Gly Pro Ile Arg Val Leu Asp Ala Glu
              55              60              65
```

```
ggg gtg ccg gtg gcg ctc gcc gat ccg gtg ctg ctg gcg gcc gcc tgc 594
Gly Val Pro Val Ala Leu Ala Asp Pro Val Leu Leu Ala Ala Ala Cys
   70              75              80
```

tcg gcg gac tcg cgg agc cgc tcg ctg ccg agc gcg ccg atc aac gcc	642
Ser Ala Asp Ser Arg Ser Arg Ser Leu Pro Ser Ala Pro Ile Asn Ala	
85 90 95 100	
ccg gac gcc ggt acc gct gtc gac tgg gtg ctc tcg tcg ctc gcc gac	690
Pro Asp Ala Gly Thr Ala Val Asp Trp Val Leu Ser Ser Leu Ala Asp	
105 110 115	
gac gag gac gac gag gtg ccc gcc ggc atg acc gcg gag gag gcg gtg	738
Asp Glu Asp Asp Glu Val Pro Ala Gly Met Thr Ala Glu Glu Ala Val	
120 125 130	
cgc ctg ctg tcg cgg cag gtc gac gac ctg ccg cgg tcg ccg ggc gcc	786
Arg Leu Leu Ser Arg Gln Val Asp Asp Leu Pro Arg Ser Pro Gly Ala	
135 140 145	
gac ccg tgg tcg ctg gtc gcc ggc ccg ctg gcg gcc atc ggg cgg ttc	834
Asp Pro Trp Ser Leu Val Ala Gly Pro Leu Ala Ala Ile Gly Arg Phe	
150 155 160	
ggg cgg gcc ggg atc gcc gac gag tgc tgg ttg ctg gag gtg ctc gcc	882
Gly Arg Ala Gly Ile Ala Asp Glu Cys Trp Leu Leu Glu Val Leu Ala	
165 170 175 180	
ggg cgg ctc cgc gcg gtc gac gac gac ctg tcc cgc tcg tgg ctg agc	930
Gly Arg Leu Arg Ala Val Asp Asp Asp Leu Ser Arg Ser Trp Leu Ser	
185 190 195	
agt ccg acg ctc gcc gac cgc gct gtg ctc gtg ggt gag ggg ttg cgc	978
Ser Pro Thr Leu Ala Asp Arg Ala Val Leu Val Gly Glu Gly Leu Arg	
200 205 210	
tac cgg ccg gat gtg cgg ccg gtg ccg ttc gac gtg ccg aac ccg ctg	1026
Tyr Arg Pro Asp Val Arg Pro Val Pro Phe Asp Val Pro Asn Pro Leu	
215 220 225	
cac gag ggc aag tcc gac gtc ccg ccg ccg ccc gtg ccc gtg ctg ggc	1074
His Glu Gly Lys Ser Asp Val Pro Pro Pro Pro Val Pro Val Leu Gly	
230 235 240	
ggg ccg tgg tcg ctg cgt ccg gtc gag gtc gcg gtc cac ggg gat ggc	1122
Gly Pro Trp Ser Leu Arg Pro Val Glu Val Ala Val His Gly Asp Gly	
245 250 255 260	
ggg cct gac gtc gca ctg gtg cac cgc tgg atg aac acc ccg cac gtc	1170
Gly Pro Asp Val Ala Leu Val His Arg Trp Met Asn Thr Pro His Val	
265 270 275	
gcg cac cac tgg aac cag gcg tgg ccg ctg gag cgc tgg cgg gag gaa	1218
Ala His His Trp Asn Gln Ala Trp Pro Leu Glu Arg Trp Arg Glu Glu	
280 285 290	
ctc gcc cac cag ctc ggc ggt gag cac tcc ctg ccc tgc gtg gtc gga	1266
Leu Ala His Gln Leu Gly Gly Glu His Ser Leu Pro Cys Val Val Gly	
295 300 305	
cac gag gga cgc gag gtc gcg tat ctg gag ctc tac cgg gtg acc cgc	1314
His Glu Gly Arg Glu Val Ala Tyr Leu Glu Leu Tyr Arg Val Thr Arg	
310 315 320	
gac aag ctt gcg ggc tgc tac ccg tac ggg ccg cac gac ctc ggg gtc	1362
Asp Lys Leu Ala Gly Cys Tyr Pro Tyr Gly Pro His Asp Leu Gly Val	

```

325.          330          335          340
cac atc gcg atc ggc gag cgg gag gtg ctc ggg cgc ggt ttc ggg tcg 1410
His Ile Ala Ile Gly Glu Arg Glu Val Leu Gly Arg Gly Phe Gly Ser
          345          350          355

tcg ctg ctg cgc gcg gtc gcg ggt gcg ctg ctg gac gcc gat ccg cgg 1458
Ser Leu Leu Arg Ala Val Ala Gly Ala Leu Leu Asp Ala Asp Pro Arg
          360          365          370

tgc gcg cgg gtg gtc gcc gag ccg aat gtg cac aac gag gct tcg gtg 1506
Cys Ala Arg Val Val Ala Glu Pro Asn Val His Asn Glu Ala Ser Val
          375          380          385

cgc gcc ttc gcc aag gcc ggg ttc gtc cgg gag agg gag atc ggc ctg 1554
Arg Ala Phe Ala Lys Ala Gly Phe Val Arg Glu Arg Glu Ile Gly Leu
          390          395          400

ccc gcc aag aac tcg gct ctg atg gtc ttc tcc cgg gtc t gacgaccggt 1604
Pro Ala Lys Asn Ser Ala Leu Met Val Phe Ser Arg Val
405          410          415

catgccccctg tgtgaacgcg tgagtaagcg caccgtgacg tgatcccccg cttgaaccaa 1664
ggttagcctt acttttattg gtggagaacg atgccggagc gctccgccgt gtcgttgccg 1724
ctgaccacag cgcagtaggg catctggttc gccacgcaac tcgaccggac gaacccgatc 1784
tacaacaccg gcgagtgcgt cgagatcagc ggcccgggtg agccggtggt gttcgagcag 1844
gccctgcggt ggggcgtggc ggaggccgag gcgctgcgag cccgcgtggt cgtcgacggc 1904
gacgagccgc gccaggtcgt ggagccggag gtggacttcc cgctgccgtg ctcgacgtca 1964
gcgccgaggc ggaccc 1980

```

<210> 2

<211> 417

<212> PRT

<213> Saccharopolyspora erythraea

<400> 2

```

Val Ala Gly Asp Val Glu Leu Ala Asp Arg Ala Arg Arg Arg Ala Cys
 1          5          10          15
Arg Leu Leu Arg Arg Trp Leu Ala Glu Thr His Thr Pro Val Glu Pro
          20          25          30
Gly Pro Leu Ser Leu Arg Ile Gly Pro Val Arg Val Ser Ala Glu Val
          35          40          45
Ala Tyr Arg Ser Pro Thr Gly Ala His Gly Phe Gly Pro Ile Arg Val
          50          55          60
Leu Asp Ala Glu Gly Val Pro Val Ala Leu Ala Asp Pro Val Leu Leu
65          70          75          80
Ala Ala Ala Cys Ser Ala Asp Ser Arg Ser Arg Ser Leu Pro Ser Ala
          85          90          95
Pro Ile Asn Ala Pro Asp Ala Gly Thr Ala Val Asp Trp Val Leu Ser
          100          105          110
Ser Leu Ala Asp Asp Glu Asp Asp Glu Val Pro Ala Gly Met Thr Ala
          115          120          125
Glu Glu Ala Val Arg Leu Leu Ser Arg Gln Val Asp Asp Leu Pro Arg
          130          135          140
Ser Pro Gly Ala Asp Pro Trp Ser Leu Val Ala Gly Pro Leu Ala Ala
145          150          155          160
Ile Gly Arg Phe Gly Arg Ala Gly Ile Ala Asp Glu Cys Trp Leu Leu
          165          170          175
Glu Val Leu Ala Gly Arg Leu Arg Ala Val Asp Asp Asp Leu Ser Arg
          180          185          190
Ser Trp Leu Ser Ser Pro Thr Leu Ala Asp Arg Ala Val Leu Val Gly
          195          200          205
Glu Gly Leu Arg Tyr Arg Pro Asp Val Arg Pro Val Pro Phe Asp Val

```

```

      210      215      220
Pro Asn Pro Leu His Glu Gly Lys Ser Asp Val Pro Pro Pro Pro Val
225      230      235      240
Pro Val Leu Gly Gly Pro Trp Ser Leu Arg Pro Val Glu Val Ala Val
      245      250      255
His Gly Asp Gly Gly Pro Asp Val Ala Leu Val His Arg Trp Met Asn
      260      265      270
Thr Pro His Val Ala His His Trp Asn Gln Ala Trp Pro Leu Glu Arg
      275      280      285
Trp Arg Glu Glu Leu Ala His Gln Leu Gly Gly Glu His Ser Leu Pro
      290      295      300
Cys Val Val Gly His Glu Gly Arg Glu Val Ala Tyr Leu Glu Leu Tyr
305      310      315      320
Arg Val Thr Arg Asp Lys Leu Ala Gly Cys Tyr Pro Tyr Gly Pro His
      325      330      335
Asp Leu Gly Val His Ile Ala Ile Gly Glu Arg Glu Val Leu Gly Arg
      340      345      350
Gly Phe Gly Ser Ser Leu Leu Arg Ala Val Ala Gly Ala Leu Leu Asp
      355      360      365
Ala Asp Pro Arg Cys Ala Arg Val Val Ala Glu Pro Asn Val His Asn
      370      375      380
Glu Ala Ser Val Arg Ala Phe Ala Lys Ala Gly Phe Val Arg Glu Arg
385      390      395      400
Glu Ile Gly Leu Pro Ala Lys Asn Ser Ala Leu Met Val Phe Ser Arg
      405      410      415
Val

```

```

<210> 3
<211> 929
<212> PRT
<213> Saccharopolyspora eruthraea

```

```

<400> 3
Met His Val Pro Gly Glu Glu Asn Gly His Ser Ile Ala Ile Val Gly
1      5      10      15
Ile Ala Cys Arg Leu Pro Gly Ser Ala Thr Pro Gln Glu Phe Trp Arg
      20      25      30
Leu Leu Ala Asp Ser Ala Asp Ala Leu Asp Glu Pro Pro Ala Gly Arg
      35      40      45
Phe Pro Thr Gly Ser Leu Ser Ser Pro Pro Ala Pro Arg Gly Gly Phe
50      55      60
Leu Asp Ser Ile Asp Thr Phe Asp Ala Asp Phe Phe Asn Ile Ser Pro
65      70      75      80
Arg Glu Ala Gly Val Leu Asp Pro Gln Gln Arg Leu Ala Leu Glu Leu
      85      90      95
Gly Trp Glu Ala Leu Glu Asp Ala Gly Ile Val Pro Arg His Leu Arg
      100      105      110
Gly Thr Arg Thr Ser Val Phe Met Gly Ala Met Trp Asp Asp Tyr Ala
      115      120      125
His Leu Ala His Ala Arg Gly Glu Ala Ala Leu Thr Arg His Ser Leu
130      135      140
Thr Gly Thr His Arg Gly Met Ile Ala Asn Arg Leu Ser Tyr Ala Leu
145      150      155      160
Gly Leu Gln Gly Pro Ser Leu Thr Val Asp Thr Gly Gln Ser Ser Ser
      165      170      175
Leu Ala Ala Val His Met Ala Cys Glu Ser Leu Ala Arg Gly Glu Ser
      180      185      190
Asp Leu Ala Leu Val Gly Gly Val Asn Leu Val Leu Asp Pro Ala Gly
195      200      205
Thr Thr Gly Val Glu Arg Phe Gly Ala Leu Ser Pro Asp Gly Arg Cys
210      215      220

```

Tyr.	Thr	Phe	Asp	Ser	Arg	Ala	Asn	Gly	Tyr	Ala	Arg	Gly	Glu	Gly	Gly	225	230	235	240
Val	Val	Val	Val	Leu	Lys	Pro	Thr	His	Arg	Ala	Leu	Ala	Asp	Gly	Asp	245	250	255	
Thr	Val	Tyr	Cys	Glu	Ile	Leu	Gly	Ser	Ala	Leu	Asn	Asn	Asp	Gly	Ala	260	265	270	
Thr	Glu	Gly	Leu	Thr	Val	Pro	Ser	Ala	Arg	Ala	Gln	Ala	Asp	Val	Leu	275	280	285	
Arg	Gln	Ala	Trp	Glu	Arg	Ala	Arg	Val	Ala	Pro	Thr	Asp	Val	Gln	Tyr	290	295	300	
Val	Glu	Leu	His	Gly	Thr	Gly	Thr	Pro	Ala	Gly	Asp	Pro	Val	Glu	Ala	305	310	315	320
Glu	Gly	Leu	Gly	Thr	Ala	Leu	Gly	Thr	Ala	Arg	Pro	Ala	Glu	Ala	Pro	325	330	335	
Leu	Leu	Val	Gly	Ser	Val	Lys	Thr	Asn	Ile	Gly	His	Leu	Glu	Gly	Ala	340	345	350	
Ala	Gly	Ile	Ala	Gly	Leu	Leu	Lys	Thr	Val	Leu	Ser	Ile	Lys	Asn	Arg	355	360	365	
His	Leu	Pro	Ala	Ser	Leu	Asn	Phe	Thr	Ser	Pro	Asn	Pro	Arg	Ile	Asp	370	375	380	
Leu	Asp	Ala	Leu	Arg	Leu	Arg	Val	His	Thr	Ala	Tyr	Gly	Pro	Trp	Pro	385	390	395	400
Ser	Pro	Asp	Arg	Pro	Leu	Val	Ala	Gly	Val	Ser	Ser	Phe	Gly	Met	Gly	405	410	415	
Gly	Thr	Asn	Cys	His	Val	Val	Leu	Ser	Glu	Leu	Arg	Asn	Ala	Gly	Gly	420	425	430	
Asp	Gly	Ala	Gly	Lys	Gly	Pro	Tyr	Thr	Gly	Thr	Glu	Asp	Arg	Leu	Gly	435	440	445	
Ala	Thr	Glu	Ala	Glu	Lys	Arg	Pro	Asp	Pro	Ala	Thr	Gly	Asn	Gly	Pro	450	455	460	
Asp	Pro	Ala	Gln	Asp	Thr	His	Arg	Tyr	Pro	Pro	Leu	Ile	Leu	Ser	Ala	465	470	475	480
Arg	Ser	Asp	Ala	Ala	Leu	Arg	Ala	Gln	Ala	Glu	Arg	Leu	Arg	His	His	485	490	495	
Leu	Glu	His	Ser	Pro	Gly	Gln	Arg	Leu	Arg	Asp	Thr	Ala	Tyr	Ser	Leu	500	505	510	
Ala	Thr	Arg	Arg	Gln	Val	Phe	Glu	Arg	His	Ala	Val	Val	Thr	Gly	His	515	520	525	
Asp	Arg	Glu	Asp	Leu	Leu	Asn	Gly	Leu	Arg	Asp	Leu	Glu	Asn	Gly	Leu	530	535	540	
Pro	Ala	Pro	Gln	Val	Leu	Leu	Gly	Arg	Thr	Pro	Thr	Pro	Glu	Pro	Gly	545	550	555	560
Gly	Leu	Val	Phe	Val	Phe	Pro	Gly	Gln	Gly	Pro	Gln	Trp	Arg	Gly	Met	565	570	575	
Gly	Val	Glu	Leu	Met	Ala	Ala	Ser	Pro	Val	Phe	Ala	Ala	Arg	Met	Arg	580	585	590	
Gln	Cys	Ala	Asp	Ala	Leu	Ile	Pro	His	Thr	Gly	Trp	Asp	Pro	Ile	Ala	595	600	605	
Met	Leu	Asp	Asp	Pro	Glu	Val	Thr	Arg	Arg	Val	Asp	Val	Val	His	Pro	610	615	620	
Val	Cys	Trp	Ala	Val	Met	Val	Ser	Leu	Ala	Ala	Val	Trp	Glu	Ala	Ala	625	630	635	640
Gly	Val	Arg	Pro	Asp	Ala	Val	Ile	Gly	His	Ser	Gln	Gly	Glu	Ile	Ala	645	650	655	
Ala	Ala	Cys	Val	Ala	Gly	Ala	Leu	Thr	Leu	Glu	Asp	Gly	Ala	Arg	Leu	660	665	670	
Val	Ala	Leu	Arg	Ser	Val	Leu	Leu	Leu	Arg	Glu	Leu	Ala	Gly	Arg		675	680	685	
Gly	Ala	Met	Gly	Ser	Val	Ala	Leu	Pro	Ala	Ala	Asp	Val	Glu	Ala	Asp	690	695	700	
Ala	Ala	Arg	Ile	Asp	Gly	Val	Trp	Val	Ala	Gly	Arg	Asn	Gly	Ala	Thr	705	710	715	720
Thr	Thr	Thr	Val	Ala	Gly	Arg	Pro	Asp	Ala	Val	Glu	Thr	Leu	Ile	Ala				

```

      725      730      735
Asp Tyr Glu Ala Arg Gly Val Trp Val Arg Arg Ile Ala Val Asp Cys
      740      745      750
Pro Thr His Thr Pro Phe Val Asp Pro Leu Tyr Asp Glu Leu Gln Arg
      755      760      765
Ile Val Ala Asp Thr Thr Ser Arg Thr Pro Glu Ile Pro Trp Phe Ser
      770      775      780
Thr Ala Asp Glu Arg Trp Ile Asp Ala Pro Leu Asp Asp Glu Tyr Trp
885      790      795      800
Phe Arg Asn Met Arg His Pro Val Gly Phe Ala Thr Ala Val Thr Ala
      805      810      815
Ala Arg Glu Pro Gly Asp Thr Val Phe Val Glu Val Ser Ala His Pro
      820      825      830
Val Leu Leu Pro Ala Ile Asp Gly Ala Thr Val Ala Thr Leu Arg Arg
      835      840      845
Gly Gly Gly Val His Arg Leu Leu Thr Ala Leu Ala Glu Ala His Thr
850      855      860
Thr Gly Val Pro Val Asp Trp Ala Ala Val Val Pro Ala Thr Ala Thr
865      870      875      880
Ala His Asp Leu Pro Thr Tyr Ala Phe His His Glu Arg Tyr Trp Ile
      885      890      895
Ser His Trp Leu Pro Ser Gly Glu Ala His Pro Arg Pro Ala Asp Asp
      900      905      910
Thr Glu Ser Gly Thr Gly Arg Thr Glu Ala Ser Pro Pro Arg Pro His
      915      920      925
Asp

```

```

<210> 4
<211> 888
<212> PRT
<213> Saccharopolyspora erythraea

```

```

<400> 4
Met His Val Pro Gly Glu Glu Asn Gly Glu Pro Leu Ala Ile Val Gly
 1      5      10      15
Met Ala Cys Arg Leu Pro Gly Gly Val Ala Ser Pro Glu Asp Leu Trp
      20      25      30
Arg Leu Leu Glu Ser Gly Gly Asp Gly Ile Thr Ala Phe Pro Thr Asp
      35      40      45
Arg Gly Trp Asp Val Asp Gly Leu Tyr Asp Pro Asp Pro Asp His Pro
      50      55      60
Gly Thr Ser Thr Val Arg His Gly Gly Phe Leu Ala Gly Val Ala Asp
65      70      75      80
Phe Asp Ala Ala Phe Phe Gly Ile Ser Pro Arg Glu Ala Leu Ala Met
      85      90      95
Asp Pro Gln Gln Arg Leu Val Leu Glu Thr Ser Trp Glu Ala Leu Glu
      100      105      110
His Ala Gly Ile Leu Pro Glu Ser Leu Arg Gly Ser Asp Thr Gly Val
      115      120      125
Phe Met Gly Ala Phe Ser Asp Gly Tyr Gly Leu Gly Thr Asp Leu Gly
      130      135      140
Gly Phe Gly Ala Thr Gly Thr Gln Thr Ser Val Leu Ser Gly Arg Leu
145      150      155      160
Ser Tyr Phe Tyr Gly Leu Glu Gly Pro Ala Val Thr Val Asp Thr Ala
      165      170      175
Cys Ser Ser Ser Leu Val Ala Leu His Gln Ala Gly Gln Ser Leu Arg
      180      185      190
Ser Gly Glu Cys Ser Leu Ala Leu Val Gly Gly Val Thr Val Met Ala
      195      200      205
Ser Pro Ser Gly Phe Val Glu Phe Ser Gln Gln Arg Gly Leu Ala Pro
210      215      220

```

Asp.	Ala	Arg	Cys	Lys	Ala	Phe	Ala	Asp	Ala	Ala	Asp	Gly	Thr	Gly	Phe
225					230				235						240
Ala	Glu	Gly	Ser	Gly	Val	Leu	Ile	Val	Glu	Arg	Leu	Ser	Asp	Ala	Glu
				245					250					255	
Arg	Asn	Gly	His	Arg	Val	Leu	Ala	Val	Val	Arg	Gly	Ser	Ala	Val	Asn
			260					265					270		
Gln	Asp	Gly	Ala	Ser	Asn	Gly	Leu	Ser	Ala	Pro	Asn	Gly	Pro	Ser	Gln
	275						280					285			
Glu	Arg	Val	Ile	Arg	Gln	Ala	Leu	Ala	Asn	Ala	Gly	Leu	Thr	Pro	Ala
	290					295					300				
Asp	Val	Asp	Ala	Val	Glu	Ala	His	Gly	Thr	Gly	Thr	Arg	Leu	Gly	Asp
305					310					315					320
Pro	Ile	Glu	Ala	Gln	Ala	Val	Leu	Ala	Thr	Tyr	Gly	Gln	Gly	Arg	Asp
				325					330					335	
Thr	Pro	Val	Leu	Leu	Gly	Ser	Leu	Lys	Ser	Asn	Ile	Gly	His	Thr	Gln
			340					345					350		
Ala	Ala	Ala	Gly	Val	Ala	Gly	Val	Ile	Lys	Met	Val	Leu	Ala	Met	Arg
		355					360					365			
His	Gly	Thr	Leu	Pro	Arg	Thr	Leu	His	Val	Asp	Thr	Pro	Ser	Ser	His
	370					375					380				
Val	Asp	Trp	Thr	Ala	Gly	Ala	Val	Glu	Leu	Leu	Thr	Asp	Ala	Arg	Pro
385					390					395					400
Trp	Pro	Glu	Thr	Asp	Arg	Pro	Arg	Arg	Ala	Gly	Val	Ser	Ser	Phe	Gly
				405					410					415	
Val	Ser	Gly	Thr	Asn	Ala	His	Val	Leu	Leu	Glu	Ala	His	Pro	Ala	Gly
			420					425					430		
Glu	Pro	Pro	Ala	Glu	Glu	Pro	Ser	Ala	Ser	Lys	Pro	Gly	Glu	Pro	Leu
		435					440					445			
Ile	Ala	Thr	Pro	Leu	Thr	Pro	Leu	Pro	Val	Ser	Ala	Arg	Thr	Ala	Thr
	450					455					460				
Ala	Leu	Asp	Gly	Gln	Val	Arg	Arg	Leu	Arg	Glu	His	Leu	Ala	Ala	Arg
465					470					475					480
Pro	Gly	His	Asp	Pro	Arg	Ala	Ile	Ala	Ala	Gly	Leu	Leu	Ala	Arg	Arg
				485					490					495	
Thr	Thr	Phe	Pro	His	Arg	Ala	Val	Leu	Leu	Asp	Asp	Asp	Val	Val	Thr
			500					505					510		
Gly	Thr	Ala	Leu	Thr	Glu	Pro	Arg	Thr	Val	Phe	Val	Phe	Pro	Gly	Gln
		515					520					525			
Gly	Pro	Gln	Trp	Arg	Gly	Met	Gly	Val	Glu	Leu	Met	Ala	Ala	Ser	Pro
	530					535					540				
Val	Phe	Ala	Ala	Arg	Met	Arg	Gln	Cys	Ala	Asp	Ala	Leu	Ile	Pro	His
545					550					555					560
Thr	Gly	Trp	Asp	Pro	Ile	Ala	Met	Leu	Asp	Asp	Pro	Glu	Val	Thr	Arg
				565					570					575	
Arg	Val	Asp	Val	Val	His	Pro	Val	Cys	Trp	Ala	Val	Met	Val	Ser	Leu
			580					585					590		
Ala	Ala	Val	Trp	Glu	Ala	Ala	Gly	Val	Arg	Pro	Asp	Ala	Val	Ile	Gly
		595					600					605			
His	Ser	Gln	Gly	Glu	Ile	Ala	Ala	Ala	Cys	Val	Ala	Gly	Ala	Leu	Thr
	610					615					620				
Leu	Glu	Asp	Gly	Ala	Arg	Leu	Val	Ala	Leu	Arg	Ser	Val	Leu	Leu	Leu
625					630					635					640
Leu	Arg	Glu	Leu	Ala	Gly	Arg	Gly	Ala	Met	Gly	Ser	Val	Ala	Leu	Pro
				645					650					655	
Ala	Ala	Asp	Val	Glu	Ala	Asp	Ala	Ala	Arg	Ile	Asp	Gly	Val	Trp	Val
			660				665						670		
Ala	Gly	Arg	Asn	Gly	Ala	Thr	Thr	Thr	Thr	Val	Ala	Gly	Arg	Pro	Asp
		675					680					685			
Ala	Val	Glu	Thr	Leu	Ile	Ala	Asp	Tyr	Glu	Ala	Arg	Gly	Val	Trp	Val
	690					695					700				
Arg	Arg	Ile	Ala	Val	Asp	Cys	Pro	Thr	His	Thr	Pro	Phe	Val	Asp	Pro
705					710					715					720
Leu	Tyr	Asp	Glu	Leu	Gln	Arg	Ile	Val	Ala	Asp	Thr	Thr	Ser	Arg	Thr

Pro	Glu	Ile	Pro	Trp	Phe	Ser	Thr	Ala	Asp	Glu	Arg	Trp	Ile	Asp	Ala
			725						730					735	
Pro	Leu	Asp	Asp	Glu	Tyr	Trp	Phe	Arg	Asn	Met	Arg	His	Pro	Val	Gly
		740						745					750		
Phe	Ala	Thr	Ala	Val	Thr	Ala	Ala	Arg	Glu	Pro	Gly	Asp	Thr	Val	Phe
	755						760					765			
Val	Glu	Val	Ser	Ala	His	Pro	Val	Leu	Leu	Pro	Ala	Ile	Asp	Gly	Ala
	770				775						780				
Thr	Val	Ala	Thr	Leu	Arg	Arg	Gly	Gly	Gly	Val	His	Arg	Leu	Leu	Thr
				805					810					815	
Ala	Leu	Ala	Glu	Ala	His	Thr	Thr	Gly	Val	Pro	Val	Asp	Trp	Ala	Ala
		820						825					830		
Val	Val	Pro	Ala	Thr	Ala	Thr	Ala	His	Asp	Leu	Pro	Thr	Tyr	Ala	Phe
		835					840					845			
His	His	Glu	Arg	Tyr	Trp	Ile	Ser	His	Trp	Leu	Pro	Ser	Gly	Glu	Ala
	850					855					860				
His	Pro	Arg	Pro	Ala	Asp	Asp	Thr	Glu	Ser	Gly	Thr	Gly	Arg	Thr	Glu
	865				870					875					880
Ala	Ser	Pro	Pro	Arg	Pro	His	Asp								
				885											

<210> 5

<211> 888

<212> PRT

<213> Saccharopolyspora erythraea

<400> 5

Met	His	Val	Pro	Gly	Glu	Glu	Asn	Gly	Glu	Pro	Leu	Ala	Ile	Val	Gly
1				5					10					15	
Met	Ala	Cys	Arg	Leu	Pro	Gly	Gly	Val	Ala	Ser	Pro	Glu	Asp	Leu	Trp
			20					25					30		
Arg	Leu	Leu	Glu	Ser	Gly	Gly	Asp	Gly	Ile	Thr	Ala	Phe	Pro	Thr	Asp
		35					40					45			
Arg	Gly	Trp	Asp	Val	Asp	Gly	Leu	Tyr	Asp	Pro	Asp	Pro	Asp	His	Pro
	50					55					60				
Gly	Thr	Ser	Thr	Val	Arg	His	Gly	Gly	Phe	Leu	Ala	Gly	Val	Ala	Asp
	65				70					75				80	
Phe	Asp	Ala	Ala	Phe	Phe	Gly	Ile	Ser	Pro	Arg	Glu	Ala	Leu	Ala	Met
			85						90					95	
Asp	Pro	Gln	Gln	Arg	Leu	Val	Leu	Glu	Thr	Ser	Trp	Glu	Ala	Leu	Glu
			100					105					110		
His	Ala	Gly	Ile	Leu	Pro	Glu	Ser	Leu	Arg	Gly	Ser	Asp	Thr	Gly	Val
		115					120					125			
Phe	Met	Gly	Ala	Phe	Ser	Asp	Gly	Tyr	Gly	Leu	Gly	Thr	Asp	Leu	Gly
	130					135					140				
Gly	Phe	Gly	Ala	Thr	Gly	Thr	Gln	Thr	Ser	Val	Leu	Ser	Gly	Arg	Leu
	145				150					155				160	
Ser	Tyr	Phe	Tyr	Gly	Leu	Glu	Gly	Pro	Ala	Val	Thr	Val	Asp	Thr	Ala
			165					170						175	
Gln	Ser	Ser	Ser	Leu	Val	Ala	Leu	His	Gln	Ala	Gly	Gln	Ser	Leu	Arg
			180					185					190		
Ser	Gly	Glu	Cys	Ser	Leu	Ala	Leu	Val	Gly	Gly	Val	Thr	Val	Met	Ala
		195					200					205			
Ser	Pro	Ser	Gly	Phe	Val	Glu	Phe	Ser	Gln	Gln	Arg	Gly	Leu	Ala	Pro
	210					215					220				
Asp	Ala	Arg	Cys	Lys	Ala	Phe	Ala	Asp	Ala	Ala	Asp	Gly	Thr	Gly	Phe
	225				230					235				240	
Ala	Glu	Gly	Ser	Gly	Val	Leu	Ile	Val	Glu	Arg	Leu	Ser	Asp	Ala	Glu
			245						250					255	
Arg	Asn	Gly	His	Arg	Val	Leu	Ala	Val	Val	Arg	Gly	Ser	Ala	Val	Asn
			260				265							270	

Gln.	Asp	Gly	Ala	Ser	Asn	Gly	Leu	Ser	Ala	Pro	Asn	Gly	Pro	Ser	Gln	275	280	285
Glu	Arg	Val	Ile	Arg	Gln	Ala	Leu	Ala	Asn	Ala	Gly	Leu	Thr	Pro	Ala	290	295	300
Asp	Val	Asp	Ala	Val	Glu	Ala	His	Gly	Thr	Gly	Thr	Arg	Leu	Gly	Asp	305	310	315
Pro	Ile	Glu	Ala	Gln	Ala	Val	Leu	Ala	Thr	Tyr	Gly	Gln	Gly	Arg	Asp	325	330	335
Thr	Pro	Val	Leu	Gly	Ser	Leu	Lys	Ser	Asn	Ile	Gly	His	Thr	Gln		340	345	350
Ala	Ala	Ala	Gly	Val	Ala	Gly	Val	Ile	Lys	Met	Val	Leu	Ala	Met	Arg	355	360	365
His	Gly	Thr	Leu	Pro	Arg	Thr	Leu	His	Val	Asp	Thr	Pro	Ser	Ser	His	370	375	380
Val	Asp	Trp	Thr	Ala	Gly	Ala	Val	Glu	Leu	Leu	Thr	Asp	Ala	Arg	Pro	385	390	395
Trp	Pro	Glu	Thr	Asp	Arg	Pro	Arg	Arg	Ala	Gly	Val	Ser	Ser	Phe	Gly	405	410	415
Val	Ser	Gly	Thr	Asn	Ala	His	Val	Leu	Leu	Glu	Ala	His	Pro	Ala	Gly	420	425	430
Glu	Pro	Pro	Ala	Glu	Glu	Pro	Ser	Ala	Ser	Lys	Pro	Gly	Glu	Pro	Leu	435	440	445
Ile	Ala	Thr	Pro	Leu	Thr	Pro	Leu	Pro	Val	Ser	Ala	Arg	Thr	Ala	Thr	450	455	460
Ala	Leu	Asp	Gly	Gln	Val	Arg	Arg	Leu	Arg	Glu	His	Leu	Ala	Ala	Arg	465	470	475
Pro	Gly	His	Asp	Pro	Arg	Ala	Ile	Ala	Ala	Gly	Leu	Leu	Ala	Arg	Arg	485	490	495
Thr	Thr	Phe	Pro	His	Arg	Ala	Val	Leu	Leu	Asp	Asp	Asp	Val	Val	Thr	500	505	510
Gly	Thr	Ala	Leu	Thr	Glu	Pro	Arg	Thr	Val	Phe	Val	Phe	Pro	Gly	Gln	515	520	525
Gly	Pro	Gln	Trp	Arg	Gly	Met	Gly	Val	Glu	Leu	Met	Ala	Ala	Ser	Pro	530	535	540
Val	Phe	Ala	Ala	Arg	Met	Arg	Gln	Cys	Ala	Asp	Ala	Leu	Ile	Pro	His	545	550	555
Thr	Gly	Trp	Asp	Pro	Ile	Ala	Met	Leu	Asp	Asp	Pro	Glu	Val	Thr	Arg	565	570	575
Arg	Val	Asp	Val	Val	His	Pro	Val	Cys	Trp	Ala	Val	Met	Val	Ser	Leu	580	585	590
Ala	Ala	Val	Trp	Glu	Ala	Ala	Gly	Val	Arg	Pro	Asp	Ala	Val	Ile	Gly	595	600	605
His	Ser	Gln	Gly	Glu	Ile	Ala	Ala	Ala	Cys	Val	Ala	Gly	Ala	Leu	Thr	610	615	620
Leu	Glu	Asp	Gly	Ala	Arg	Leu	Val	Ala	Leu	Arg	Ser	Val	Leu	Leu	Leu	625	630	635
Leu	Arg	Glu	Leu	Ala	Gly	Arg	Gly	Ala	Met	Gly	Ser	Val	Ala	Leu	Pro	645	650	655
Ala	Ala	Asp	Val	Glu	Ala	Asp	Ala	Ala	Arg	Ile	Asp	Gly	Val	Trp	Val	660	665	670
Ala	Gly	Arg	Asn	Gly	Ala	Thr	Thr	Thr	Val	Ala	Gly	Arg	Pro	Asp		675	680	685
Ala	Val	Glu	Thr	Leu	Ile	Ala	Asp	Tyr	Glu	Ala	Arg	Gly	Val	Trp	Val	690	695	700
Arg	Arg	Ile	Ala	Val	Asp	Cys	Pro	Thr	His	Thr	Pro	Phe	Val	Asp	Pro	705	710	715
Leu	Tyr	Asp	Glu	Leu	Gln	Arg	Ile	Val	Ala	Asp	Thr	Thr	Ser	Arg	Thr	725	730	735
Pro	Glu	Ile	Pro	Trp	Phe	Ser	Thr	Ala	Asp	Glu	Arg	Trp	Ile	Asp	Ala	740	745	750
Pro	Leu	Asp	Asp	Glu	Tyr	Trp	Phe	Arg	Asn	Met	Arg	His	Pro	Val	Gly	755	760	765
Phe	Ala	Thr	Ala	Val	Thr	Ala	Ala	Arg	Glu	Pro	Gly	Asp	Thr	Val	Phe			

770						775						780			
Val	Glu	Val	Ser	Ala	His	Pro	Val	Leu	Leu	Pro	Ala	Ile	Asp	Gly	Ala
785					790					795					800
Thr	Val	Ala	Thr	Leu	Arg	Arg	Gly	Gly	Gly	Val	His	Arg	Leu	Leu	Thr
				805					810					815	
Ala	Leu	Ala	Glu	Ala	His	Thr	Thr	Gly	Val	Pro	Val	Asp	Trp	Ala	Ala
			820					825					830		
Val	Val	Pro	Ala	Thr	Ala	Thr	Ala	His	Asp	Leu	Pro	Thr	Tyr	Ala	Phe
		835					840					845			
His	His	Glu	Arg	Tyr	Trp	Ile	Ser	His	Trp	Leu	Pro	Ser	Gly	Glu	Ala
	850					855					860				
His	Pro	Arg	Pro	Ala	Asp	Asp	Thr	Glu	Ser	Gly	Thr	Gly	Arg	Thr	Glu
865					870					875					880
Ala	Ser	Pro	Pro	Arg	Pro	His	Asp								
				885											